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## FOOD SCIENCE & TECHNOLOGY | REVIEW ARTICLE

# Street vended foods in Nigeria: An analysis of the current state of affairs and the way forward

Ifeanyi Michael Mazi<sup>1</sup>, Helen Onyeaka<sup>2\*</sup>, Hope Akegbe<sup>1</sup>, Esther Ibe Njoagwuani<sup>1</sup>, Chidinma Ezinne Ochulor<sup>3</sup>, Iyiola Olatunji Oladunjoye<sup>4</sup>, Adeola Dolapo Omotosho<sup>5</sup>, Ogueri Nwaiwu<sup>2</sup>, Phemelo Tamasiga<sup>6</sup> and Olumide A. Odeyemi<sup>7</sup>

**Abstract:** This review article focuses on the safety of street-vended foods (SVFs) in Nigeria, a cultural phenomenon that has become a major source of income and nutrition for many, particularly in low- and middle-income countries. Despite their popularity, SVFs have been associated with unsanitary practices and public health risks due to inadequate monitoring by government agencies and limited coverage in the National food safety policy documents. In this review, we examine the challenges faced by SVFs in Nigeria and recommend better collaboration between food safety stakeholders and the government to address these issues. We also suggest the passage of the Food Safety and Quality Bill (FSQB) as a solution to the gaps in the regulation of street foods and institutional reform of food safety management through the establishment of a National Food Safety Commission. By implementing these recommendations, we can ensure the safety of street-vended foods in Nigeria.

**Subjects:** Epidemiology; Food Microbiology; Processing; Food Laws & Regulations; Consumer Psychology

**Keywords:** street-vended foods; street foods; Food Safety; Nigeria; Food Safety Policy

### 1. Introduction

Street-vended foods (SVF), equally referred to as street foods, are “foods and beverages prepared and/or sold by vendors in street and other public places for immediate consumption or consumption at a later time without further processing or preparation” (WHO, 1996). Historically, SVFs have long been a part of the culture of many countries throughout the globe, particularly in low and

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middle-income countries (LMIC). The continuous expansion of the street food vending sector is expected to increase due to the growth in the world population, urbanization, globalization, and changing consumer dietary preferences (WHO, 1996; 2019). It is regarded as a major source of income for many low-income earners, especially women (Adeosun et al., 2022), and it also serves as a popular tourist attraction, contributing significantly to the economy (Abrahale et al., 2019; Imathiu, 2017; Ma et al., 2019). The profitability of the food industry has led to the emergence of numerous street food vendors, both trained and untrained, with the street food vending business estimated to produce approximately 6–20% of employment in Nigeria (Adeosun et al., 2022; Emmanuel et al., 2015).

According to Imathlu (2017), it is estimated that nearly 2.6 billion people worldwide consume street-vended food daily. In some countries, such as Malaysia, street food vending businesses generate over US\$ 2 billion in annual sales, while in Zambia, the annual turnover sales were recorded to be over US\$ 100 million. In Africa, over 80% of urban dwellers patronize street food vendors, with Nigeria being a prime example where an average household spends nearly half of its overall food budget on street-vended food (Imathiu, 2017). The popularity of street-vended food has also been growing significantly in North America recently (Fusté-Forné, 2021). However, despite the immense popularity of street food vending businesses, there is a lack of government regulation in most developing countries. In Nigeria and other low- and middle-income countries, the government has limited coverage of street-vended foods in their most comprehensive food safety documents and has shown an apparent inability to effectively monitor street food vending activities. This has resulted in significant food safety and public health concerns in these countries, as unsanitary practices surrounding street food vending can lead to foodborne illnesses, nutritional deficiencies, and an increased risk of chronic diseases (Fusté-Forné, 2021). In some African countries like Ethiopia and South Africa, studies have shown that the consumption of contaminated street foods has contributed to the burden of foodborne diseases (Rakha et al., 2022). The most common food borne pathogens associated with SVFs include *Escherichia coli*, *Shigella* spp., *Salmonella* spp., *Clostridium perfringens*, *Campylobacter jejuni*, *Bacillus cereus* and *Staphylococcus aureus* (Birgen et al., 2020). In Ghana, analysis of certain local street foods was found to contain high levels of heavy metals greater than the maximum daily intake level of tolerance for heavy metals (Ankar-Brewoo et al., 2020).

Street-vended foods (SVFs) serve as an important source of food for both rural and urban poor communities in low- and middle-income countries (LMICs) such as Nigeria, as well as an alternative to cooking for urban residents with sedentary lifestyles (WHO, 2019). Street food vendors (SFVs) are food handlers who sell food to the public using semi-static or temporary structures or moveable vending sites, rather than permanent structures (Janie & Marie, 2010; Nurudeen et al., 2014). According to the World Health Organization (WHO), eligible street food vending sites are those that sell ready-to-eat food, including beverages and snacks, from a location rather than a permanent storefront business or an establishment with four permanent walls that operates within a predefined perimeter and does not sell directly on the street. This definition encompasses street hawkers, mobile vendors, and other semi-static or fixed vending units. However, a vending location that focuses on selling food products for domestic consumption is not considered an eligible vending site, even if the physical layout and foods sold meet the requirements specified above (WHO, 2019).

Street food vending business provides socioeconomic, food security, and nutritional benefits; however, it is considered a serious public health risk due to various reasons (WHO, 1996). In developing countries like Nigeria, SFVs often lack essential infrastructure and services critical to the food industry, such as portable water and power supply, making them more susceptible to food contamination (Muyanja et al., 2011). In addition, limited resources often prevent LMICs from properly inspecting and testing the safety of the foods sold by SFVs (WHO, 1996). SFVs themselves often lack proper education and training in food handling and safety, and are not aware of the health hazards posed by consuming unsafe street foods (Samapundo et al., 2015; WHO, 1996).

Successful implementation of food safety standards requires SFVs to demonstrate basic food safety knowledge, attitudes, and practical (KAP) abilities, validated by relevant authorized agencies using proven food safety toolkits (Aluko et al., 2014; Cortese et al., 2016).

The aim of this article is to evaluate the food safety and public health implications of street vending in Nigeria, with a focus on street-vended foods (SVFs). We first review the history and literature of numerous studies on the safety of SVFs sold around the country. We then discuss the country's food safety policies and regulations in relation to SVFs, as well as the challenges inherent in improving SVF safety in Nigeria. Finally, we provide recommendations and discuss future perspectives for ensuring the safety of SVFs in Nigeria.

### **1.1. Overview of street food vending in Nigeria**

According to Edeme and Nkalu (2018), street food vending in Nigeria has been in existence since the colonial era, and it has become an integral part of Nigerians' lifestyle (Amfani-Joe, 2017). However, studies have revealed poor hygiene and sanitary practices among street food vendors in Nigeria. For instance, Nurudeen et al. (2014) found that 60% of food vendors prepared their foods in unhygienic environments, 53.6% of the vendors did not cover their hair, and about 18.9% did not properly store leftovers intended for subsequent sales. The study also revealed that food vendors lacked basic knowledge and training on hygiene. However, Iwu et al. (2017) reported that 87% of participants had knowledge of food hygiene in a similar study. It is important for street food vendors to have knowledge of standard food hygiene and safety practices as poor handling and preparation of street food could pose serious health risks to Nigerian consumers (Emmanuel et al., 2015).

Abdulkareem et al. (2014) conducted a study in Northern Nigeria which found that 49.9% of food vendors lacked access to clean water, with many resorting to using dirty water and recycled wash water for cooking and cleaning activities. In addition, 73.6% of vendors did not properly wash raw food items due to inadequate water supply. The study concluded that food vendors in this region prioritized financial gain over adherence to food safety and hygiene measures. Similarly, Emmanuel et al. (2015) conducted a related study in Plateau state, Northern Nigeria, and found that 81.5% of street food vendors had no training in food preparation and handling, and 75% of untrained vendors did not practice safe food handling.

A survey conducted among street food vendors in Benin City, Edo State revealed that 71.3% of the vendors were not familiar with the term "foodborne disease", which was in contrast to a study conducted in Abeokuta, Nigeria where most vendors had heard of the term (Okojie & Isah, 2019; Omemu & Aderoju, 2008). Furthermore, 73.9% of the vendors had never received any food safety training, which was associated with poor knowledge of food safety and hygiene as 78.3% of the vendors had poor knowledge of food safety (Okojie & Isah, 2019). In another study, it was found that street food vendors in some parts of Lagos State, including Apapa, had high microbial loads in their foods, which could be attributed to poor food handling practices, inadequate sanitation at vending sites, improper waste disposal, and poor hygiene conditions of the vendors (Israel & Samuel, 2020).

According to a study on food safety practices conducted in Asaba, Delta state, 51.7% of street food vendors (SFVs) did not wash food before cooking, and 41.7% did not practice personal hygiene during food handling. However, 91.7% of them obtained hygienic water, and most of the vendors used clean water and reusable towels to clean their utensils during food preparation (Gbigbi & Okonkwo, 2021). Similarly, a recent study on personal hygiene practices between SFVs and canteen food services in Northwestern Nigeria found that both groups had high measures of personal hygiene, with canteen food handlers scoring higher (74.0%) than street food vendors (70.2%) (Ibrahim et al., 2021).

**Table 1. List of common street-vended foods in Nigeria**

<b>List of Common Street Vended Foods and Beverages in Nigeria</b>		
• Salad	• Jollof rice	• Meat pie
• Doughnut	• Cake	• Sausage
• Fried meat	• Fried chicken	• Fried turkey
• Edible maggot	• Fried fish	• Stewed meat
• Roasted plantain	• Roasted yam	• Spaghetti
• Boiled White rice	• Beans	• Buns
• Moi-moi	• Fried plantain	• Dakun
• Bean cake (Akara)	• Suya	• Kundi
• Kunu	• Pito	• Eggs
• Soup	• Sliced RTE fruits	• Shawarma-sandwiches
• Plantain chips	• Beef sausage rolls	• Bottled drinks
• Bambara nut pudding	• Boiled corn	• Roasted corn

Source: Authors' contribution.

Another study conducted by Aluh and Aluh (2017) to determine the food safety knowledge, attitudes, and practices (KAP) among rural Nigerians revealed that 81.37% of food vendors had knowledge of food hygiene, acquired through seminars/workshops, TV/radio, customers, among others. However, a significant number of food vendors (41.7%) considered quantity more important than freshness when purchasing food items (Aluh & Aluh, 2017). These practices of most food vendors are not in line with the five crucial components developed by WHO for achieving safer foods, as highlighted in a review by Onyeaka et al. (2021). A list of common street-vended foods sold in Nigeria is provided in Table 1.

## 2. Impact of SVF on public health/food safety

The World Health Organization (WHO) declared that around 600 million people fall ill as a result of foodborne disease (FBD), with 420, 000 people dying each year (Devleesschauer et al., 2018; Havelaar et al., 2015) (Jaffee et al., 2018) mentioned that the economic costs of FBD were about USD 20 billion annually. In Africa, three key hazards are known to impact public health, including bacterial and viral hazards, parasitic hazards, and natural chemical hazards (GFSP, 2019; Van Seventer & Hamer, 2017). Together, bacterial and viral hazards account for about 70% of the overall estimated foodborne disease burden. Salmonella is responsible for the most mortality rate in Africa, i.e. about one-third of all foodborne hazards-related death – 32, 000 annually. On the other hand, parasitic hazards make up roughly 17% of the FBD burden, with *Taenia solium*, affecting millions of individuals and causing the death of about 15,000 people in Africa. *Ascaris* spp. is another major foodborne parasite of concern in the region. Finally, aflatoxin stands as the most predominant pervasive chemical hazard in sub-Saharan Africa. The WHO report concluded that aflatoxin-related FBD accounted for more than 1% of the total disease burden evaluated (Havelaar et al., 2015).

Various studies to determine the presence of heavy metals and their toxicity level in street vended foods have been carried out in Nigeria. While Lead (Pb) has been the focus of many studies on heavy metals in street vended foods in Nigeria, it is not the only heavy metal found in these

foods. Other heavy metals such as Cadmium, Copper, Mercury, Iron, Zinc, Chromium, manganese, and Aluminium have also been detected in commonly consumed street foods sold in Nigeria. However, the levels of these metals were found to be below the permissible limits set by the World Health Organization (WHO) for heavy metals, except for Lead. This is why Lead has received more attention in studies of heavy metals in street vended foods in Nigeria, due to its high toxicity level and potential health risks. (Ekhaton et al., 2017; Nkwunonwo et al., 2020; Oyet & Samuel, 2020). Generally, lead can be found in the environment from natural sources such as soil, water, and air pollution, as well as anthropogenic sources such as industrial activities, mining, and the use of lead-containing products such as gasoline, batteries, and paint. Street-vended foods can become contaminated with lead through several routes, such as the use of contaminated ingredients, contaminated water for washing and cooking, and the use of lead-containing utensils for cooking and serving. Additionally, lead may also leach into food from the environment during storage, handling, and transport. Table 2 shows the concentration (mg/kg) of Lead (Pb) in some commonly eaten street-vended foods sold in Nigeria.

In Nigeria, foodborne disease is endemic, and as far back as 1997, the Local Government Health System evaluation showed that diarrhea was the leading cause of mortality at the time, accounting for 25% of all recorded deaths (Aluko et al., 2014). As evidenced in 1991, when street food and contaminated water were implicated in the deaths of 7,654 Nigerians, disregarding appropriate hygiene procedures can lead to devastating cases of foodborne diseases and water-related diseases like typhoid and cholera (Codjia, 2000). FBDs were observed to occur primarily as isolated occasional occurrences rather than large epidemics, with several FBD cases being unreported, uninvestigated, or undocumented (FMoH, 2004 e42, pp. 41; Aluko et al., 2014). According to the WHO 2015 report, WHO Region AFR-D, in which Nigeria is located, was found to have the highest

**Table 2. Concentration (mg/kg) of lead (Pb) in commonly consumed street-vended foods sold in Nigeria**

Street Vended Foods	Lead (Pb) Concentration (mg/kg)
	WHO/FAO maximum permissible limit = 0.01 mg/kg
Salad	0.14
Jollof rice	0.31
Meat pie	0.24
Doughnut	0.21
Cake	0.12
Sausage	0.14
Fried meat	0.31
Fried chicken	0.026
Fried turkey	0.14
Edible maggot	0.014
Fried fish	0.2
Stewed meat	1.34
Roasted plantain	0.31
Roasted yam	0.13
Spaghetti	0.24
White rice	1.033
Beans	1.37
Buns	0.14
Moi-moi	1.24
Fried plantain	0.24

Source: (Ekhaton et al., 2017).

per capita burden of FBD in the world (Havelaar et al., 2015). Foodborne disease is estimated to have caused approximately 173 million diarrheal cases and nearly 33, 000 deaths, with an accompanying annual cost of treatment valued at USD 1.7 billion (excluding overall lost productivity) (Grace et al., 2018). Several studies have found that food handling errors, such as temperature and exposure time violations, as well as personal and environmental hygiene problems, are one of the most common contributors to FBD outbreaks (Angelo et al., 2017; Hull-Jackson & Adesiyun, 2019; Wu et al., 2018). It was also noticed that most FBD outbreaks resulted from preventable food handling mistakes made by food handlers (da Cunha, 2021), including SVFs. Furthermore, street foods have been linked to certain outbreaks of foodborne illness in several countries (Aluko et al., 2014). The rapid increase in eating away from home (Kolady et al., 2020; Swai, 2019; Tawodzera, 2019; Wegerif, 2020), facilitated by easily accessible SVFs has amplified concerns about FBD posed by SVFs (da Cunha, 2021) as substantial proof suggests that considerable proportions of raw and ready-to-eat foods bought across African markets are often compromised during purchase (Paudyal et al., 2017).

There are several negative impacts associated with the consumption of street-vended foods (SVFs) in Nigeria and other low- and middle-income countries. Some of these negative impacts include:

- Foodborne illnesses: As mentioned earlier, certain SVFs are prepared under unsanitary conditions, which can lead to foodborne illnesses such as diarrhea, cholera, and typhoid fever. These illnesses can result in dehydration, malnutrition, and in severe cases, even death.
- Nutritional deficiencies: SVFs are often sold as quick and cheap meals, which may not provide adequate nutrition. This can lead to nutritional deficiencies, particularly in vulnerable populations such as children and pregnant women.
- Increased risk of chronic diseases: SVFs are often high in fat, salt, and sugar, which can increase the risk of chronic diseases such as obesity, diabetes, and cardiovascular disease.
- Environmental pollution: The preparation and disposal of SVFs can contribute to environmental pollution, particularly in urban areas where they are popular. This can have negative impacts on the health of individuals living in these areas.
- Economic impact: While SVFs provide a source of income for many street vendors, the negative health impacts associated with their consumption can lead to increased healthcare costs and lost productivity, which can have a negative economic impact on individuals and the country as a whole.

In summary, the negative impacts associated with the consumption of SVFs in Nigeria and other low- and middle-income countries are significant and multifaceted. Improved food safety policies and guidelines, increased collaboration between food safety stakeholders and the government, and increased public education and awareness are necessary to address these issues and improve the safety and nutritional value of SVFs.

### **3. Development of food safety policy on street food in Nigeria**

In Nigeria, there are currently four main national policy documents that address the issue of food safety. Of the four documents, three have sections bordering on food safety, while the fourth document covers policy and implementation strategies aimed at improving food safety oversight functions in the nation (Okoruwa & Onuigbo-Chatta, 2021). The four (4) national policy documents include:

- (1) The Agriculture Promotion Policy (2015-2020) of the Federal Ministry of Agriculture and Rural Development (FMARD)
- (2) The National Food and Nutrition Policy (2016) of the Ministry of Budget and National Planning (MBNP)
- (3) The National Policy on the Environment (Revised 2016) of the Federal Ministry of Environment (FME)



(4) The National Policy on Food Safety and Its Implementation Strategy (NPFIS 2014) of the Federal Ministry of Health (FMOH)

Historically, past and present governments have made efforts to ensure the food safety and quality of countries' food supply chains. The first known law that addressed food safety in Nigeria was the Public Health Ordinance Cap 165 of 1958, which has its source in the Public Health Laws of 1917. Over the years, various legislation establishing different food control agencies in the country were enacted (Omojokun, 2013). Currently, there are more than 30 functional Food Safety Enabling Acts administered by different agencies across the federal, state, and local government council areas (Okoruwa & Onuigbo-Chatta, 2021).

The National Council on Health of Nigeria produced a National Policy on Food Safety (NPFS) in 1999 after a series of meetings. The NPFS, which is part of the Nigerian National Health Policy, established a public-private partnership approach to addressing the country's food safety matters by establishing a National Committee on Food Safety, which included representatives across the food chain continuum. The NPFS serves as a national institutional framework for consolidating all of the country's existing food safety and control systems, thus guaranteeing food safety. The relevant actors in food safety control in Nigeria include The Federal Ministry of Health (FMOH), National Agency for Food and Drug Administration and Control (NAFDAC), Standards Organization of Nigeria (SON), Federal Ministry of Trade and Investment (FMITI), Federal Ministry of Environment (FMOE), The Federal Ministry of Agriculture and Rural Development (FMA&RD), The Federal Department of Fisheries, Nigeria Plant Quarantine Service (NPQS), Consumer Protection Council

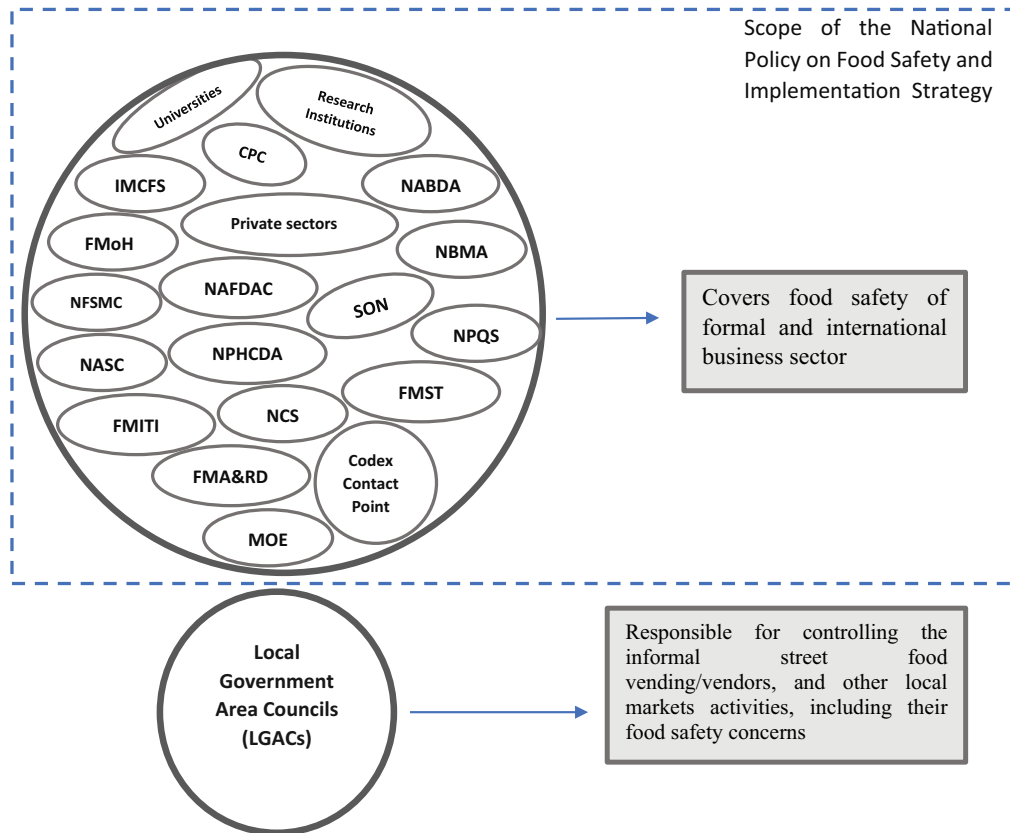
**Table 3. Some food safety Laws and regulations in Nigeria to date**

<b>Nigeria's Food Safety Laws and Regulations</b>	<b>Year Enacted</b>
Public Health Laws	1917
Public Health Ordinance Cap 165	1958
Standards Organization of Nigeria Decree No. 56	1971
Food and Drug Act No. 35	1974
Animal Disease Control Decree No. 10	1988
Marketing of Breast Milk Substitute Decree No. 41	1990
The Food, Drug, and Related Products (Registration etc) Decree No 19	1993
National Agency for Food and Drugs Administration and Control Decree No 15	1993
Counterfeit and Fake Drugs and Unwholesome Processed Food Act No 25	1999
NAFDAC Act CAP N1 Laws of the Federal Republic of Nigeria	2004
Marketing (Breast Milk) Act Cap M5 LFN	2004
Food, Drugs & Related Products (Registration etc) Act Cap F33	2004
Food and Drug Act Cap F32 Laws of the FRN	2004
Counterfeit & Fake Drugs and Unwholesome Processed Foods (Miscellaneous Provisions) Act Cap C34 LFN	2004
National Policy on Food Safety and Implementation Strategy (NPFIS)	2014
Local Government Authority Bye-laws	
Proposed Food Safety and Quality Bill (FSQB)	Yet to be passed into law

Sources: (Authors' own adaptation from Okoruwa & Onuigbo-Chatta, 2021; Omojokun, 2013).

**Figure 1. Illustration of the responsibility of government parastatals with respect to street-vended foods in Nigeria's food safety strategy.**

Source: Adapted from (Okoruwa & Onuigbo-Chatta, 2021; Omojokun, 2013).



(CPC), Federal Ministry of Education, Local Government Areas (LGAs), Universities, Research Institutes and the private sector (Omojokun, 2013).

In 2014, the FMOH developed a National Policy on Food Safety and Implementation Strategy (NPFSSIS) as part of the government's initiatives to advance food safety by revising and modernizing important parts of the national food safety control system. According to the NPFSSIS, Nigeria runs a multi-agency food safety control system that is further divided among different sectors with the aim of building and operating a contemporary and effective National Food Safety System. Currently, the advancement of food safety in the country made some gains with the proposed Draft Food Safety and Quality Bill (FSQB) developed in 2016. Although the bill addresses highlighted shortfalls identified in various laws on food safety, the passage of the bill into law has experienced major setbacks through the required legislative proceedings (Okoruwa & Onuigbo-Chatta, 2021) Table 3 gives a summary of some of these laws and regulations enacted in Nigeria till date.

In as much as a national policy on food safety exists, the impact of this policy on street food regulation in Nigeria is grossly underfelt. It is worth knowing that as comprehensive as the NPFSSIS is, it only covers food safety issues in the formal sector of the economy (Okoruwa & Onuigbo-Chatta, 2021), leaving out food safety concerns posed by the huge and growing often informal, unregulated street vending sector. In Nigeria, street food vending activities, bukaterias (roadside restaurants), catering establishments, local abattoirs, and traditional markets are under the purview of the Local Government Area Councils (Omojokun, 2013). Figure 1 illustrates the responsibility of government parastatals with respect to street-vended foods in Nigeria's food safety strategy through the activities of the various government ministries, departments, agencies (MDAs), and other bodies relevant to food safety in the country.

#### 4. Challenges to ensuring the safety of SVF in Nigeria

The street vending business sector in Nigeria is faced with challenges that result in the proliferation of serious food safety/public health concerns. The biggest challenge faced in advancing the safety of SVFs in Nigeria is the limited coverage given to SVFs in the NPFSIS—the nation’s most comprehensive policy document on food safety (Okoruwa & Onuigbo-Chatta, 2021). While the local government authorities are chiefly responsible for SVFs in their locality, including their safety, a current report revealed that more than 95% of relevant local government authorities (LGAs) in Nigeria were unable to adequately collect, analyze, and provide data on food safety, with only a few of these LGA having sufficient systems capable of responding to disease outbreaks. Over 95% of laboratories in these LGAs lack the capacity to investigate food contaminations (Tehinse & Stephen, 2021). Apart from the incapacity of the LGAs, the increasing number of SFVs has further compounded food safety regulatory activities in low- and medium-income countries (LMICs) (Trafialek et al., 2017, 2018). The GAIN foundation pointed out that the existing relationship between the Federal & State agencies and the LGA councils (LGAC) is apparently weak, creating a situation where nations’ food safety agencies do not have operational offices in the LGACs (Okoruwa & Onuigbo-Chatta, 2021). The result of this relational gap is poor management of food safety operations along the entire food value chain, particularly at the grass-root level, given that LGAs are largely responsible for coordinating the activities of street food vendors.

Another shortcoming on the part of the government militating against the efforts at achieving the safety of SVFs is the lack of essential food service infrastructure and facilities such as adequate waste disposal system and sufficient clean water supply, i.e., proper WASH (Water Sanitation and Hygiene) facilities and stable power supply, as well as lack of financial support mechanism through the provision of soft loan facilities to SFVs to invest on food safety equipment (John et al., 2018). Also, although the Nigerian government has implemented several policies aimed at assuring food safety across the entire food continuum for both export and domestic food products, including street-vended food, the country’s food safety landscape is still characterized by poor policy implementation and enforcement, inadequate inspection by food safety officers, weak surveillance system for tracking foodborne related diseases, and clear ambiguity in overlapping roles among the various agencies involved in food safety thus leading to poor national coordination (Nordhagen, 2022; Okoruwa & Onuigbo-Chatta, 2021). These problems, coupled with the local government councils’ apparent inability to adequately monitor street food vending activities make street-vended food largely unregulated and improperly coordinated in the country (Omojokun, 2013).

On the part of the SFVs, low awareness level of the public health impact of unsafe food, inadequate food safety training, and lack of/poor adherence to the practice of good hygiene as food handlers make street foods a high risk for the transmission of foodborne disease (Emmanuel et al., 2015; Okojie & Isah, 2019).

From a consumer perspective, another challenge to achieving safe street foods is the lack of interest in advocating for safer SVFs shown by Nigerian consumers as revealed through several studies which found that amongst the factors to be considered in purchasing SVFs, food safety ranked as low priority when compared to other determinants like cost and nutritional variety (Aluh & Aluh, 2017; Nordhagen et al., 2022; Onyeaka et al., 2021). Nordhagen et al. (2022) in a recent study buttressed this point by asserting that “consumers’ concerns about food safety did not seem to be overriding, i.e., they recognized that food safety concerns might arise with certain foods in circumstances, but not commonly, and those concerns did not prevent consumption of that food.” Such perception implies that consumers are unwilling to demand safer street food as long as it is affordable.

#### 5. Recommendation and future perspective on ensuring the safety of SVF in Nigeria

##### 5.1. Government Regulation and Enforcement

The Nigerian government should establish and enforce food safety regulations that apply to street-vended foods. These regulations should be periodically reviewed and updated to ensure that they

are effective in promoting food safety. The government should also ensure that regulatory agencies are properly staffed and funded to carry out their responsibilities.

### **5.2. Education and Awareness**

The government should launch public awareness campaigns to educate street food vendors and the general public about safe food handling practices. These campaigns can be in the form of workshops, seminars, and other training programs that teach food vendors how to prepare, store, and serve food safely.

### **5.3. Hygienic Practices**

The government should provide incentives to food vendors who adhere to hygienic practices. Food vendors should be encouraged to use clean water, wash their hands before and after handling food, and use disposable gloves and utensils. They should also be encouraged to store food in clean and covered containers to prevent contamination.

### **5.4. Monitoring and Surveillance**

The government should implement a system for monitoring and surveillance of street-vended foods. This could involve regular inspections of food vending sites to ensure compliance with food safety regulations. Inspectors should also test food samples to check for contamination and take necessary action in case of violations.

### **5.5. Collaboration**

There should be collaboration between government agencies, food vendors, and consumers to ensure food safety. Food vendors should be encouraged to report any cases of foodborne illness to the relevant authorities, while consumers should also report any food safety concerns they may have. This will help to identify problem areas and take corrective action to improve food safety practices.

Overall, the improvement of street-vended food safety practices in Nigeria will require a concerted effort from all stakeholders. By implementing these recommendations, the government can create a safe and healthy environment for street-vended food consumption in Nigeria.

## **6. Future directives**

In the future, there is a need for more research to be conducted on street-vended foods in Nigeria to provide a better understanding of the safety and hygiene practices employed by street food vendors. This could involve carrying out longitudinal studies to assess the impact of food safety interventions on street-vended foods. Additionally, there is a need to explore innovative approaches for regulating street food vending in Nigeria that go beyond traditional inspection and enforcement practices.

Another important area for future research is the impact of street-vended foods on the nutritional status of consumers in Nigeria. It is important to investigate the extent to which street-vended foods are meeting the nutritional needs of consumers, especially in low-income areas where street-vended foods are a major source of food. Furthermore, there is a need for more education and awareness campaigns on food safety practices for street food vendors and consumers. This can be achieved through the use of social media, radio and television programs, and the dissemination of information through health facilities and community groups.

Finally, there is a need for increased collaboration among stakeholders, including the government, street food vendors, consumers, and the private sector, to ensure the safety and hygiene of street-vended foods in Nigeria. The establishment of a National Food Safety Commission through the passage of the Food Safety and Quality Bill into Nigerian law would be a significant step in this direction. With sustained efforts and commitments from all stakeholders, street-vended foods in Nigeria can be made safe for consumption, thereby improving public health and contributing to economic growth.

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We declare that we do not have any competing interest in publishing this manuscript.

### Authors' contributions

IMM developed the concept for this review. IMM, HA, EIN, CEO, IOO & ADO wrote the first draft of the manuscript. HO, ON, PT, and OAO proofread and edited the language. IMM revised the manuscript based on feedback from HO and OAO. OH supervised the project and critically revised the final manuscript. All authors contributed to the manuscript and approved the submitted version.

### Abbreviations

SVFs: Street Vended Foods; SFVs: Street Food Vendors; IMCFS: Inter-Ministerial Committee on Food Safety; NFSMC: National Food Safety Management Committee; NPFSIS: National Policy on Food Safety & Implementation Strategy; NPFS: National Policy on Food Safety; FSQB: Food Safety & Quality Bill; FMOH: Federal Ministry of Health; FMIT: Federal Ministry of Industry, Trade & Investment; FMA&RD: Federal Ministry of Agriculture & Rural Development; FMST: Federal Ministry of Science & Technology; FMOE: Federal Ministry of Environment; MDAs: Ministries, Departments & Agencies; LGAs: Local Government Authorities; LGACs: Local Government Area Councils; NAFDAC: National Agency for Food and Drug Administration Council; NPHCDA: National Primary Health Care Development Agency; SON: Standard Organization of Nigeria; CCP: Codex Contact Point; NCC: National Codex Committee; CPC: Consumer Protection Council; NPQS: Nigeria Plant Quarantine Service; NBMA: National Biosafety Management Agency; NABDA: National Biotechnology Development Agency; NASC: National Agricultural Seeds Council; FBD: Food Borne Disease

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